REPTILES & AMPHIBIANS

A Review of Prey Taken by Anacondas (Squamata: Boidae: *Eunectes*)

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The Neotropical boid genus *Eunectes* includes four extant species (Fig. 1), the Bolivian Anaconda (*Eunectes beniensis*), Dark-spotted Anaconda (*E. deschauenseei*), Green Anaconda (*E. murinus*), and Yellow Anaconda (*E. notaeus*) (Uetz et al. 2020). These species range collectively across South America, where they inhabit a variety of habitats (Marques et al. 2016). Despite the prominence of anacondas in popular culture, no complete synthesis of their diets exists. We therefore collected information on the recorded prey items for *Eunectes* spp. published in the primary literature to provide the first summary of diet across all four species, allowing dietary comparisons within the genus.

Anacondas are specialized for aquatic hunting, where they sit and wait for prey to approach (Pizzatto et al. 2009). Although this strategy cannot explain the high incidence of

Fig. 1. The four species of anaconda: (A) Bolivian Anaconda (*Eunectes beniensis*); photograph by Phil Whitehouse; (B) Dark-spotted Anaconda (*E. deschauenseei*); photograph by Lutz Dirksen; (C) Green Anaconda (*E. murinus*); photograph by Dave Lonsdale; (D) Yellow Anaconda (*E. notaeus*); photograph by Bernard Dupont.

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egg predation seen in *E. notaeus*, it does suggest that sit-and-wait foraging is a principal component of a broader foraging repertoire (Miranda et al. 2017). Anacondas lack venom to subdue prey, relying instead on their mass to constrict and drown prey (Strimple 1993). Snakes swallow their prey whole and are considered gape-limited predators, with the size of targeted prey being determined by the diameter of the snake's head (King 2002).

We performed a literature search using Google Scholar, Web of Science, and SCOPUS. To capture as much information on the diets and natural history of anacondas as possible, we incorporated search terms to cover literature published in English, German, Portuguese, and Spanish. This generated information for all four species, although the vast majority of reports address only two species (Fig. 2; Table 1). The results indicate that species of *Eunectes* have broad diets, taking a large variety of prey items that appears to vary ontogenetically (Fig. 3; Table 1), and are trophically opportunistic, feeding on essentially any readily available prey, including livestock and other domestic animals (Miranda et al. 2016).

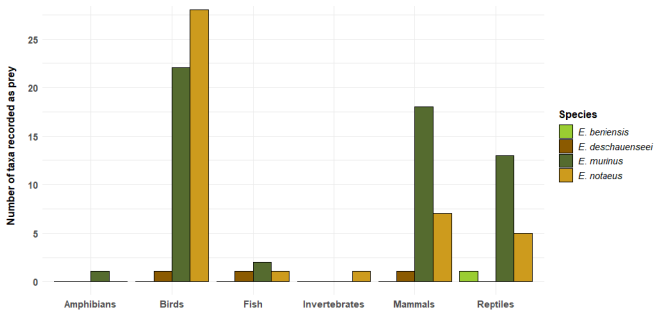

Fig. 2. Composition of the diets of the four species of anacondas in the genus *Eunectes*.

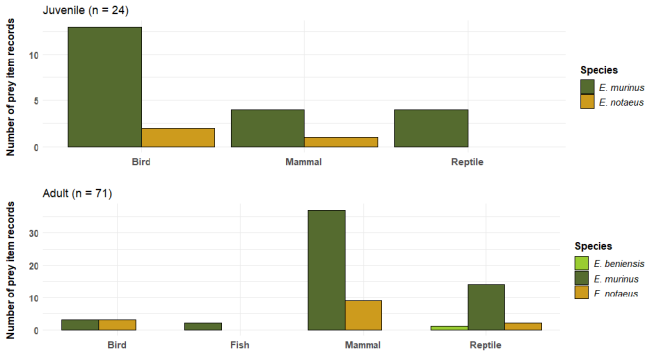

Fig. 3. Ontogenetic shifts in the diets of snakes in the genus *Eunectes* (where data are available).

Table 1. Recorded prey items for four species of anacondas (*Eunectes* spp.). A = adult; J = juvenile; U = unspecified. Sources: Quelch (1898); Beebe (1946); Wehekind (1955); Haverschmidt (1970); Duplaix (1980); Heyman (1987); Strüssmann and Sazima (1991); Strimple (1993); O'Shea (1994); Henderson et al. (1995); Strüssmann (1997); Elvey and Newlon (1998); Jácomo and Silveira (1998); Rivas et al. (1998, 2016); Martins and Oliveira (1999); Rivas (1999, 2004, 2007); Rivas and Owens (2000); Valderrama and Thorbjanarson (2001); Waller et al. (2001); Macedo-Bernarde (2006); Infante-Rivero et al. (2007); Pizzatto et al. (2009); Bernarde and Abe (2010); Barros et al. (2011); de la Quintana et al. (2011); Bagno et al. (2012); Rodrigues et al. (2016); Miranda et al. (2017); Chatellenaz et al. (2018); Camera et al. (2019).

	E. beniensis			*E. deschauenseei*			*E. murinus*			*E. notaeus*		
	A	J	U	A	J	U	A	J	U	A	J	U
INVERTEBRATES												
Ampullariidae												X
PISCES						X						X
Callichthyidae									X			
Loricariidae												
Hypostomus sp.							X					
AMPHIBIA									X			
REPTILIA												
Crocodilia												
Caiman crocodilus							X					

(continued)

	E. beniensis			*E. deschauenseei*			*E. murinus*			*E. notaeus*		
	A	J	U	A	J	U	A	J	U	A	J	U
Caiman latirostris							X					
Caiman yacare							X					X
Squamata												
Boa constrictor								X				
Eunectes beniensis	X											
Eunectes murinus							X					
Eunectes notaeus										X		
Helicops angulatus								X				
Hydrodynastes gigas												X
Iguana iguana								X				
Kentropyx sp.								X				
Tupinambis teguixin									X			
Testudines												
Kinosternon scorpioides									X			
Phrynops vanderhaegei												X
Phyrnops giba							X					
Platemys macrocephala												X
Podocnemis expansa								X				
Podocnemis vogli									X			
AVES						X						
Accipitiformes												
Rostrhamus sociabilis												X
Anseriformes												
Amazonella brasiliensis												X
Anas discors									X			
Anas versicolor												X
Cairina moschata							X	X				X
Chauna torquata												X
Chauna torquata egg												X
Dendrocygna autumnalis												X
Dendrocygna bicolor												X
Dendrocygna sp.									X			
Neochen jubata									X			
Netta peposaca												X
Charadriiformes												
Actitis macularius												X
Jacana jacana							X	X				X
Ciconiiformes												
Ciconia maguaril												X
Jabiru mycteria									X			
Mycteria americana												X

(continued)

	E. beniensis			*E. deschauenseei*			*E. murinus*			*E. notaeus*		
	A	J	U	A	J	U	A	J	U	A	J	U
Columbiformes												
Claravis pretiosa									X			
Columbina squammata									X			
Zenaida auriculata									X			
Cuculiformes												
Crotophaga ani									X			
Guira guira												X
Galliformes												
Colinus cristatus									X			
Gallus gallus								X			X	
Ortalis canicollis												X
Gruiformes												
Aramides ypecaha												X
Aramus guarauna												X
Aramus guarauna egg											X	
Porphyrio martinicus												X
Passeriformes												
Agelasticus cyanopus												X
Coryphistera alaudina												X
Molothrus bonariensis												X
Phacellodomus rufifrons									X			
Ramphocelus carbo									X			
Pelecaniformes												
Ardea alba												X
Botaurus pinnatus									X			
Bubulcus ibis												X
Butorides striata												X
Casmerodius albus									X			
Eudocimus ruber									X			
Mesembrinibis cayennenesis									X			
Nycticorax nicticorax									X			
Phimosus infuscatus									X			
Platalea ajaja												X
Plegadis falcinellus									X			
Psittaciformes												
Myiopsitta monachus												X
Suliformes												
Anhinga anhinga												X
Phalacrocorax brasilianus									X		X	
MAMMALIA						X						
Carnivora												
Canis familiaris							X	X				

(continued)

	E. beniensis			*E. deschauenseei*			*E. murinus*			*E. notaeus*		
	A	J	U	A	J	U	A	J	U	A	J	U
Cerdocyon thous							X					
Felis catus								X				
Lontra longicaudis									X			
Lycalopex gymnocercus										X		
Cervidae												
Mazma sp.									X			
Odocoileus virginiatus							X					
Cetartiodactyla												
Bos taurus							X					
Pecari tajacu									X			
Sus scrofa							X					
Didelphimorphia												
Didelphis albiventris									X			
Lutreolina crassicaudata										X		
Perissodactyla												
Tapirus terrestris									X			
Pilosa												
Tamandua tetradactyla							X					
Primata												
Saguinus mystax							X					
Rodentia												
Calomys callosus												X
Cavia aperea										X		
Coendou prehensilis							X					
Cuniculus paca								X				
Dasyprocta aguti									X			
Holochilus chacarius												X
Hydrochoerus hydrochaeris							X			X		
Oligoryzomys fornesi										X		
Scapteromys tumidus										X		

By far the most extensive literature exists for the Green Anaconda (*E. murinus*), likely as a function of its fame as one of the largest species of snake on earth, its popularity in the media (Thorbjarnarson 1995), and extensive research (see Rivas 1999) conducted on this species in the Venezuelan llanos during the late 1990s and early 2000s. The Green Anaconda also is the most widely distributed of the four species, which likely increased the number of observational dietary records, considering that such observations often are opportunistic in nature. Conversely, almost no information exists on the diet of *E. beniensis* beyond the fact that they are known to be cannibalistic, which is consistent with what is known of its congeners (de la Quintana et al. 2011).

The published literature indicates that birds are the most frequently taken prey, followed by mammals. Reptiles comprise parts of the diets of *E. notaeus, E. beniensis*, and *E. murinus*, largely as a result of predation on crocodilians and turtles and partially as a result of cannibalism. Amphibians were recorded as prey items only in *E. murinus*, although they are possibly more abundant in the diets (especially in juveniles) of the other species, given their abundance in shared habitat (Rivas et al. 2016). Despite their infamy, we found no recorded incidents of anacondas consuming humans in the primary literature. This myth undoubtedly has been exacerbated in popular culture and has no basis in fact.

Small anacondas appeared to primarily consume birds and became able to take on larger prey, such as reptiles or

large mammals, as they grew (Fig. 2; Rivas 1999; Miranda et al. 2017). However, smaller prey were taken even at larger body sizes in *E. notaeus* (Miranda et al. 2017). Miranda et al. (2017) found female *E. notaeus* ate more frequently than males and proposed that this species may feed more frequently than has been previously thought, with 68% of their sampled specimens containing food in the stomach. This was echoed in studies of other large snakes like the Reticulated Python (*Malayopython reticulatus*), with 37–45% of individuals containing prey in the gut (Shine et al. 1998).

The data presented here are likely to be incomplete representations of the diets of anacondas. Some potential prey (i.e., amphibians) often are not apparent in feces and predation of amphibians and fish in the field, for example, is more difficult to observe and record than that of a large mammal or bird (Rivas et al. 2016). Further research is needed to capture data across all life-stages of the four species, particularly *E. beniensis* and *E. deschauenseei*. Additional field surveys and new methods (e.g., use of metabarcoding to analyze feces; Brown et al. 2014) are necessary.

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